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(54) JOINED BODY OF ELECTROLYTE AND ELECTRODE AND FUEL CELL

(57)Abstract:

PROBLEM TO BE SOLVED: To prevent an electrolytic film from being damaged by a frame-shaped seal member as far as possible, and to efficiently simplify the composition.

SOLUTION: The fuel cell comprises an electrolytic film 14, an anode side electrode 16 and a cathode side electrode 18 formed on both surfaces of the electrode 14 facing each other, and a frame-shaped seal member 20 with its inner peripheral part laid between the electrolytic film 14 and the cathode side electrode 18. An inner periphery side end part 22 of the frame-shaped seal member 20 is set up so as to be curved or bent in the direction parting from the electrolytic film 14.

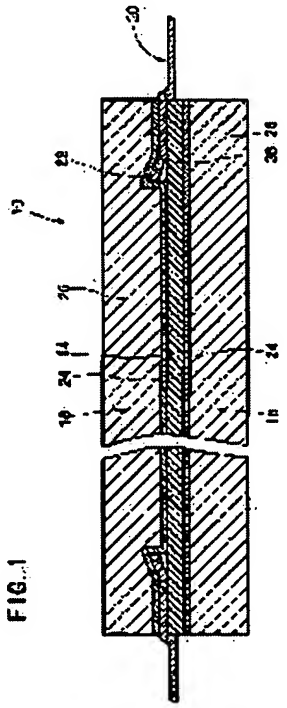

FIG. 1

LEGAL STATUS

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CLAIMS

[Claim(s)]
[Claim 1] An electrolyte membrane, and the anode lateral electrode and cathode lateral electrode opposite-**(ed) by both sides of said electrolyte membrane, It has the frame-like seal member which the inner circumference section piles up between [one / at least] said electrolyte membrane and said anode lateral electrode, or said cathode lateral electrode. Said frame-like seal member The electrolyte and electrode zygote characterized by being set as the configuration which crooks thru/or curves in the direction which the inner circumference side edge section estranges from this electrolyte membrane while covering the periphery edge of said electrolyte membrane and extending in the method of outside.
[Claim 2] While an anode lateral electrode and a cathode lateral electrode are opposite-**(ed) by both sides of an electrolyte membrane The electrolyte and electrode zygote with which the inner circumference section of a frame-like seal member is put [it piles it up and] together and constituted between [one / at least] said electrolyte membrane and said anode lateral electrode, or said cathode lateral electrode, The separator which has a gas passageway for pinching said electrolyte and electrode zygote, and supplying fuel gas to said anode lateral electrode, and supplying oxidizer gas to said cathode lateral electrode, A preparation and said frame-like seal member are a fuel cell characterized by being set as the configuration which crooks thru/or curves in the direction which the inner circumference side edge section estranges from this electrolyte membrane while covering the periphery edge of said electrolyte membrane and extending in the method of outside.
[Claim 3] It is the fuel cell characterized by setting up the overlap starting point with this electrolyte membrane between the line tops by which said frame-like seal member intersects a passage and an electrode surface in a fuel cell according to claim 2 in the periphery edge location of said electrolyte membrane, and the outermost part of the gas passageway of said separator.
[Claim 4] It is the fuel cell which said electrolyte and electrode zygote are equipped with a gaseous diffusion layer in a fuel cell according to claim 2 or 3, and is characterized by said gaseous diffusion layer having an impregnating ability seal member between the line tops which intersect a passage and an electrode surface in the periphery edge location and outermost part of the gas passageway of said separator.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the electrolyte, electrode zygote, and fuel cell with which a frame-like seal member is put [it piles it up and] together and constituted between [one / at least] an electrolyte, an anode lateral electrode, or a cathode lateral electrode.
[0002]
[Description of the Prior Art] The phosphoric acid fuel cell (PAFC) which is one gestalt of a fuel cell The phosphoric acid which is a liquid electrolyte on for example, both sides of the electrolyte membrane infiltrated into poly membranes, such as polybenzimidazole The anode lateral electrode and cathode lateral electrode which make carbon a subject, respectively an opposite the electrolyte and electrode zygote **(ed) and constituted It has the generation-of-electrical-energy cel (unit fuel cell cel) constituted by pinching with a separator (bipolar plate), and only a predetermined number carries out the laminating of this generation-of-electrical-energy cel, and is usually using it as a fuel cell stack.
[0003] On the other hand, the electrolyte membrane which consists of ion exchange membrane (cation exchange membrane) which infiltrated water into the poly fluoro ethylene sulfonic acid etc. is adopted, and only a predetermined number carries out the laminating of the generation-of-electrical-energy cel constituted with the electrolyte and electrode zygote similarly constituted with said electrolyte membrane, and a separator, and it is used for the polymer electrolyte fuel cell (SPFC) as a fuel cell stack.
[0004] In this kind of fuel cell, hydrogen is ionized on a catalyst electrode and the fuel gas supplied to the anode lateral electrode, for example, the gas which mainly contains hydrogen, (hydrogen content gas) moves to a cathode lateral electrode side through an electrolyte. The electron produced in the meantime is taken out by the external circuit, and is used as electrical energy of a direct current. In addition, since oxidizer gas, for example, the gas which mainly contains oxygen, or air (oxygen content gas) is supplied, a hydrogen ion, an electron, and oxygen react in this cathode lateral electrode, and water is generated by the cathode lateral electrode.
[0005] By the way, in order to prevent **** of fuel gas and oxidizer gas, the leakage of an electrolyte, etc., the technique (henceforth the conventional technique 1) which various seal structures are adopted, for example, is indicated by the U.S. Pat. No. 5,464,700 official report, and the technique (henceforth the conventional technique 2) currently indicated by JP,62-40170,A are known for the above-mentioned fuel cell.
[0006] The above-mentioned conventional technique 1 arranges the sealing material which is not the membrane electrode itself in the shape of a frame around [both-sides side] ion exchange membrane, and a frame-like seal member (electric insulation sheet seal) is infixed in the inner circumference region through packing ranging over between the flat-surface sections and the cells with which the above-mentioned conventional technique 2 was formed in the separator between one electrode of a cell, and a matrix.
[0007]

[Problem(s) to be Solved by the Invention] By the way, while each electrolyte membrane used for the above-mentioned fuel cell is constituted in the shape of a thin film as fairly [thickness] as dozens of micrometers, said electrolyte membrane has repeated swelling and contraction by the change in the generation water caused during operation of said fuel cell. For this reason, when a minute blemish occurs in an electrolyte membrane, said electrolyte membrane is damaged with this blemish as the starting point, and there is a possibility that cross leak of fuel gas or oxidizer gas may arise, and the generation-of-electrical-energy engine performance may fall.

[0008] When the frame-like seal member as shown in the above-mentioned conventional techniques 1 and 2 is prepared in that case, said case where it is hard an electrolyte membrane or whenever [inner circumference side acute-angle / of said frame-like seal member] contacts this electrolyte membrane has an edge the electrolyte membrane side (inner circumference side) of this frame-like seal member. The problem that a blemish occurs in an electrolyte membrane and the generation-of-electrical-energy engine performance of the whole fuel cell falls by this is pointed out.

[0009] This invention solves this kind of problem, and while preventing certainly that an electrolyte membrane is damaged by the frame-like seal member, it aims at offering the electrolyte and electrode zygote which can attain simplification of a configuration.

[0010] Moreover, this invention aims at offering the fuel cell which can prevent generation-of-electrical-energy performance degradation while it prevents certainly that an electrolyte membrane is damaged by the frame-like seal member and holds gas-seal nature effectively with an easy configuration.

[0011]

[Means for Solving the Problem] In the electrolyte and the electrode zygote concerning claim 1 of this invention, the inner circumference side edge section of the frame-like seal member by which the inner circumference section is put [piles it up and] together and arranged between [one / at least] an electrolyte membrane, an anode lateral electrode, or a cathode lateral electrode is set as the configuration which crooks thru/or curves in the direction estranged from said electrolyte. While this prevents certainly that the inner circumference side edge section of a frame-like seal member is hard an electrolyte side, it becomes possible about the acute-angle section of this inner circumference side edge section contacting said electrolyte, and doing damage to this electrolyte to prevent effectively.

[0012] And a frame-like seal member can be fabricated simply and cheaply. That is, by the usual cutting means, such as a cutter and a punching mold, in case a sheet-like seal member is formed in a frame configuration, processing is performed from one field side of the seal member of the shape of this sheet. For this reason, in case the interior of a sheet-like seal member is clipped, in the opposite side, it is easy to deform the edge of said clipping part with the side in which a cutting means exists.

[0013] Therefore, the inner circumference side edge section has curvature in one field side, and the frame-like seal member after processing should just arrange the part of this curvature to the opposite side with an electrolyte membrane. Thereby, the manufacturing cost of the whole electrolyte and electrode zygote does not soar, and it will become economical.

[0014] Moreover, the electrolyte and electrode zygote constituted as mentioned above are pinched with the separator which a gas passageway has, and it consists of fuel cells concerning claim 2 of this invention. For this reason, while preventing damage on an electrolyte membrane as much as possible and raising gas-seal nature effectively, it becomes possible to raise the endurance of said electrolyte membrane effectively, and the desired generation-of-electrical-energy engine performance can be certainly maintained over a long period of time.

[0015] Furthermore, in the fuel cell concerning claim 3 of this invention, the frame-like seal section has set up the overlap starting point with said electrolyte membrane between the line tops which intersect a passage and an electrode surface in the periphery edge location of an electrolyte membrane, and the outermost part of the gas passageway of a separator. Therefore, a frame-like seal member can be certainly stuck to an electrolyte membrane to the bottom of a pinching operation of a separator, and it becomes possible to have

an effective seal function also to the gas leak (out leak) to the direction of a perimeter of said electrolyte membrane besides generating of the cross leak by damage on said electrolyte membrane.
[0016] With the fuel cell concerning claim 4 of this invention, the electrolyte and the electrode zygote are equipped with the gaseous diffusion layer, and this gaseous diffusion layer has the impregnating ability seal member further again between the line tops which intersect a passage and an electrode surface in that periphery edge location and outermost part of the gas passageway of a separator. Thereby, the diffused resistor of gas to the direction of a periphery of an electrolyte and an electrode zygote increases, and improvement in seal nature is easily achieved with an easy configuration.
[0017]
[Embodiment of the Invention] some phosphoric acid fuel cells 12 with which drawing 1 is the configuration explanatory view of the electrolyte and the electrode zygote 10 concerning the 1st operation gestalt of this invention, and, as for drawing 2 , said electrolyte and electrode zygote 10 are incorporated -- it is a cross-section explanatory view.
[0018] An electrolyte and the electrode zygote 10 are equipped with the electrolyte membrane 14 which infiltrated the phosphoric acid into poly membranes, such as a basic polymer, for example, the polybenzimidazole film etc., the anode lateral electrode 16 and the cathode lateral electrode 18 opposite-** (ed) by both sides of said electrolyte membrane 14, said electrolyte membrane 14, and the frame-like seal member 20 which the inner circumference section piles up between said cathode lateral electrodes 18.
[0019] The frame-like seal member 20 is set as the configuration which crooks thru/or curves in the direction which the inner circumference side edge section 22 estranges from said electrolyte membrane 14 while it covers the periphery edge of an electrolyte membrane 14 and extends in the method of outside. This frame-like seal member 20 consists of polyimide films whose film pressure is 25 micrometers.
[0020] The anode lateral electrode 16 and the cathode lateral electrode 18 consist of an electrode catalyst bed 24 including the catalyst which promotes a reaction required for a generation of electrical energy on each pole, and a gaseous diffusion layer 26 which supplies the fuel gas and oxidizer gas which are reactant gas while supporting said electrode catalyst bed 24 to this electrode catalyst bed 24. The anode lateral electrode 16 and the cathode lateral electrode 18 are set as the same dimension as an electrolyte membrane 14.
[0021] As shown in drawing 2 , a phosphoric acid fuel cell 12 is equipped with an electrolyte and the electrode zygote 10, and the separator 28 of the pair as a bipolar plate which pinches said electrolyte and electrode zygote 10, and the seal member 30 is arranged between said separator 28 and the frame-like seal member 20. This seal member 30 is constituted by the sheet made from polytetrafluoroethylene, the sheet made of silicone rubber, or the usual sheet made from a rubber ingredient.
[0022] The fuel gas passage 32 for supplying the fuel gas which is reactant gas is formed in the field which counters the anode lateral electrode 16 of a separator 28. The oxidizer gas passageway 34 which supplies the oxidizer gas which is reactant gas is formed in the field which counters the cathode lateral electrode 18 of a separator 28.
[0023] The overlap starting point 36 with this electrolyte membrane 14 is set up between the line tops P2 by which the frame-like seal member 20 intersects a passage and an electrode surface in the periphery edge location P1 of an electrolyte membrane 14, and the outermost part of the fuel gas passage 32 of a separator 28, and the oxidizer gas passageway 34. The gaseous diffusion layer 26 which constitutes an electrolyte and the electrode zygote 10 has the impregnating ability seal member 38 between the periphery edge location P1 and said line top P2 of a separator 28. This impregnating ability seal member 38 has [that what is necessary is just what sinks into the gaseous diffusion layer 26 and has a desired seal function] the usable impregnant of a liquid packing agent, ceramic putty, a silicon system, or a fluorine system etc.
[0024] Drawing 3 is the outline configuration explanatory view of the fuel cell system 40 by which the phosphoric acid fuel cell 12 constituted as mentioned above is incorporated.
[0025] Usually two or more laminatings of this phosphoric acid fuel cell 12 are carried out in the direction

of arrow-head A, it is constituted as a fuel cell stack, and the loads 42, such as a motor, are connected to the inter-electrode one for current collection which it does not illustrate. Fuel gas supply path 44a and fuel gas discharge path 44b which are open for free passage to the fuel gas passage 32, and oxidizer gas supply path 46a and oxidizer gas discharge path 46b which are open for free passage to the oxidizer gas passageway 34 are connected to a phosphoric acid fuel cell 12.

[0026] The source 48 of hydrogen storage for supplying from the upstream the hydrogen content gas which is fuel gas with high pressure toward the entrance side of a phosphoric acid fuel cell 12, a solenoid valve 50, a reducing valve 52, a pressure sensor 54, the quantity-of-gas-flow controller 56, the latching valve 58, the check valve 60, the heating heater 62, and the input pressure sensor 64 are arranged at fuel gas supply path 44a. While the output-pressure sensor 66, a heat exchanger 68, the vapor-liquid-separation machine 70, and a back-pressure valve 72 are arranged at fuel gas discharge path 44b, the solenoid valve 74 is formed in the outlet side of this vapor-liquid-separation machine 70.

[0027] Oxidizer gas supply path 46a and oxidizer gas discharge path 46b are constituted like the above-mentioned fuel gas supply path 44a and fuel gas discharge path 44b, Sign a is given to the same component at the same reference figure, and the detailed explanation is omitted. The compressor 76 for supplying air as oxidizer gas is arranged at the upstream of this oxidizer gas supply path 46a. The climate control system 78 for controlling the temperature of this phosphoric acid fuel cell 12 is formed in the phosphoric acid fuel cell 12.

[0028] Drawing 4 is the outline configuration explanatory view of the manufacturing installation 80 for manufacturing the electrolyte and the electrode zygote 10 constituted as mentioned above, and drawing 5 is the longitudinal-section explanatory view of said manufacturing installation 80.

[0029] A manufacturing installation 80 is equipped with the bottom press plate 82 and the bottom press plate 84, and the frame part 86 for a press which holds an electrolyte membrane 14, the anode lateral electrode 16, and the cathode lateral electrode 18 in one is formed in said bottom press plate 82. While pressurizing and heating joining the anode lateral electrode 16 and the cathode lateral electrode 18 to both sides of an electrolyte membrane 14, the press section 88 for joining the frame-like seal member 20 is formed between said electrolyte membranes 14 and said cathode lateral electrodes 18 at the bottom press plate 84.

[0030] In the frame part 86 for a press, the 1st spacer 90 for positioning the anode lateral electrode 16, the 2nd spacer 92 for positioning the cathode lateral electrode 18, and the 3rd and 4th spacers 94 and 96 for joining the frame-like seal member 20 are arranged. These 3rd and 4th spacers 94 and 96 are suitably used, in case the frame-like seal members 20 and 20a of a pair are joined in the 2nd operation gestalt mentioned later.

[0031] Next, the activity which manufactures an electrolyte and the electrode zygote 10 is explained using the manufacturing installation 80 constituted in this way.

[0032] As shown in drawing 5 , while the 1st and 3rd spacers 90 and 94 are arranged in the frame part 86 for a press of the bottom press plate 82, the anode lateral electrode 16 is held and positioned by this 1st spacer 90. After the electrolyte membrane 14 has been arranged on this anode lateral electrode 16, positioning arrangement of the cathode lateral electrode 18 and the frame-like seal member 20 is carried out through the 2nd and 4th spacers 92 and 96 on said electrolyte membrane 14.

[0033] The frame-like seal member 20 is arranged at the side which estranges the inner circumference side edge section 22 which crooks thru/or curves from an electrolyte membrane 14 in that case. By performing processing processing from one field side of a sheet-like seal member by general cutting means, such as a cutter and a punching mold, this frame-like seal member 20 clips the interior of the seal member of the shape of this sheet, and is fabricated. Therefore, with the cutting means of the frame-like seal member 20, the inner circumference side edge section 22 which crooks thru/or curves is formed in the opposite side. Thereby, fabrication operation of the frame-like seal member 20 is quickly carried out at an easy process.

[0034] In this condition, through the bottom press plate 82 and the bottom press plate 84, 4x106Pa and

temperature perform 145 degrees C under the conditions for 30 seconds, and time amount performs [welding pressure] pressurization and heat-treatment. Thereby, while the anode lateral electrode 16 and the cathode lateral electrode 18 are joined by both sides of an electrolyte membrane 14 in one, the frame-like seal member 20 is joined between said electrolyte membranes 14 and said cathode lateral electrodes 18, and an electrolyte and the electrode zygote 10 are manufactured.

[0035] Here, while there is a possibility that anode lateral electrode 16 the very thing and cathode lateral electrode 18 the very thing, and the catalyst bed in an electrode 16 and 18 may be damaged as welding pressure is 4x106Pa or more, there is a possibility that the junction force may become [welding pressure] inadequate by 1x106Pa or less. For this reason, within the limits of 1x106Pa - 4x106Pa is suitable for welding pressure.

[0036] Moreover, that what is necessary is just within the limits of room temperature -200 degree C, the temperature at the time of junction has a possibility that the phosphoric acid in an electrolyte membrane 14 may condense, and film reinforcement may fall, when it exceeds 200 degrees C. The unification with an electrolyte membrane 14, the anode lateral electrode 16, and the cathode lateral electrode 18 is performed by the anchor effect in the polybenzimidazole film and catalyst bed interface of said electrolyte membrane 14. For this reason, as for the need of softening this polybenzimidazole film and making an anchor effect discovering to temperature, it is desirable to set up within the limits of 80 degrees C - 160 degrees C.

[0037] Even if it sets up a jointing time for a long time, while it is required for a junction condition not to improve and to set up time amount short from a viewpoint of productivity further again, we are anxious about the fall of the bonding strength by time amount becoming short. For this reason, as for a jointing time, it is desirable to set up within the limits of 20 seconds - 60 seconds.

[0038] As shown in the electrolyte and the electrode zygote 10 manufactured as mentioned above at drawing 2 , while pinching the periphery side of the frame-like seal member 20 and arranging the seal member 30 of a pair, the separator 28 of a pair is opposite-**(ed) by the both sides of said electrolyte and electrode zygote 10 in contact with this seal member 30, said anode lateral electrode 16, and said cathode lateral electrode 18. For example, a fluorine system impregnant is applied to the gaseous diffusion layer 26 corresponding to the periphery section of an electrolyte and the electrode zygote 10.

[0039] A phosphoric acid fuel cell 12 is constituted by this, and a phosphoric acid fuel cell stack is assembled by an end plate's (not shown) being arranged by those direction both-ends side of a laminating while the laminating only of the predetermined number is carried out in the direction of arrow-head A, and this phosphoric acid fuel cell's 12 binding tight in one, and holding it through the tie rod which said end plate does not illustrate, a fluorine system impregnant sinking into the gaseous diffusion layer 26, and the impregnating ability seal member 38 being constituted.

[0040] Thus, actuation of the fuel cell system 40 by which the phosphoric acid fuel cell 12 constituted is incorporated is explained below.

[0041] As shown in drawing 3 , after high-pressure hydrogen content gas is supplied from the source 48 of hydrogen storage and this hydrogen content gas is adjusted to the specified quantity and predetermined temperature through the quantity-of-gas-flow controller 56 and heating heater 62 grade, by the fuel gas supply path 44a side, the fuel gas passage 32 of the separator 28 which constitutes a phosphoric acid fuel cell 12 is supplied. The hydrogen content gas supplied to this fuel gas passage 32 is sent to the vapor-liquid-separation machine 70 from the heat exchanger 68 by which intact hydrogen content gas was formed in fuel gas discharge path 44b, and is divided into a gas component and a liquid component while it is supplied to the anode lateral electrode 16.

[0042] On the other hand, in the oxidizer gas supply path 46a side, oxygen content gas, for example, air, is supplied through a compressor 76, and this air is supplied to a phosphoric acid fuel cell 12, after that flow rate and temperature are adjusted by quantity-of-gas-flow controller 56a and heating heater 62a. In this phosphoric acid fuel cell 12, while air is sent to the oxidizer gas passageway 34 of a separator 28 and this air is supplied to the cathode lateral electrode 18, intact air is sent to vapor-liquid-separation machine 70a

through heat exchanger 68a prepared in oxidizer gas discharge path 46b. By this, a generation of electrical energy will be performed by the phosphoric acid fuel cell 12, and power will be supplied to the loads 42, such as a motor.

[0043] In this case, with the 1st operation gestalt, the frame-like seal member 20 which constitutes an electrolyte and the electrode zygote 10 provides the inner circumference side edge section 22 which crooks thru/or curves in the direction estranged from an electrolyte membrane 14, as shown in drawing 1 . For this reason, it can prevent certainly that the inner circumference side edge section 22 of the frame-like seal member 20 is not hard electrolyte membrane 14, the acute-angle section of said inner circumference side edge section 22 moreover does not contact said electrolyte membrane 14, and a blemish occurs in this electrolyte membrane 14.

[0044] Even if the electrolyte membrane 14 with which thickness consists of poly membranes, such as thin polybenzimidazole, thereby especially is used, the effectiveness of becoming possible not to be damaged with this blemish as the starting point, and to prevent generating of cross leak of fuel gas or oxidizer gas as much as possible is acquired. And the fabrication operation of the inner circumference side edge section 22 of the frame-like seal member 20 is simplified, and the manufacturing cost of said frame-like seal member 20 can be held down cheaply.

[0045] Moreover, in the phosphoric acid fuel cell 12 concerning the 1st operation gestalt, as shown in drawing 2 , the overlap starting point 36 with the electrolyte membrane 14 of the frame-like seal member 20 is set up between the periphery edge location P1 of an electrolyte membrane 14, and the line top P2 which intersects a passage and an electrode surface in the outermost part of the fuel gas passage 32 of a separator 28, and the oxidizer gas passageway 34. Therefore, the frame-like seal member 20 and an electrolyte membrane 14 can be certainly compressed in the thickness direction in the flat-surface section of a separator 28, and there is an advantage that the seal nature to the gas leak to the direction of a peripheral surface of said electrolyte membrane 14 and the so-called out leak improves effectively.

[0046] With the phosphoric acid fuel cell 12, the gaseous diffusion layer 26 which constitutes an electrolyte and the electrode zygote 10 has the impregnating ability seal member 38 further again between the periphery edge location P1 and the above-mentioned line top P2. For this reason, the diffused resistor of gas to the direction of a periphery of an electrolyte and the electrode zygote 10 can be increased sharply, and it becomes possible to prevent a gas leak much more certainly.

[0047] Then, the experiment which measures the cross leak and out leak by the single phosphoric acid fuel cell 12 was conducted using the fuel cell system 40 shown in drawing 3 . For the rate of gas utilization of 100kPaG(s) and hydrogen content gas, the rate of gas utilization of oxidizer gas was [the current density whose service condition is a phosphoric acid fuel cell 12 / the operating pressure of 0.4 A/cm2 and hydrogen content gas / the operating pressure of 100kPaG(s) and oxidizer gas / 50% and operation time] 300 hours 50%.

[0048] First, the measuring method of the amount of cross leaks is explained. When detecting the amount of cross leaks from the anode lateral electrode 16 side to the cathode lateral electrode 18 side, while fuel gas discharge path 44b which is the outlet side of the phosphoric acid fuel cell 12 of fuel gas was blockaded, oxidizer gas supply path 46a which is the entrance side of said phosphoric acid fuel cell 12 of oxidizer gas was blockaded, gaseous helium was introduced into fuel gas supply path 44a, and the pressure of 50kPa(s) was applied to said fuel gas supply path 44a. And the gaseous helium which carried out cross leak from the anode lateral electrode 16 side at the cathode lateral electrode 18 side was taken out from the oxidizer gas discharge path 46b side within the phosphoric acid fuel cell 12, and the amount of cross leaks was measured with the Minakami substitution method.

[0049] On the other hand, when measuring the amount of cross leaks from the cathode lateral electrode 18 side to the anode lateral electrode 16 side, oxidizer gas discharge path 46b and fuel gas supply path 44a were blockaded, gaseous helium was introduced from the oxidizer gas supply path 46a side, and the pressure of 50kPa(s) was applied to said oxidizer gas supply path 46a. And the gaseous helium which

carried out cross leak at the anode lateral electrode 16 side from the cathode lateral electrode 18 side in a phosphoric acid fuel cell 12 was taken out from the fuel gas discharge path 44b side, and the amount of cross leaks was measured with the Minakami substitution method.

[0050] These results are shown in drawing 6 and the increment in the amount of cross leaks was not accepted between the anode lateral electrode 16 and the cathode lateral electrode 18 after 300-hour operation.

[0051] Moreover, in measurement of the amount of out leaks, when measuring the amount of out leaks from the anode lateral electrode 16 side, where fuel gas discharge path 44b, oxidizer gas supply path 46a, and oxidizer gas discharge path 46b are blockaded, gaseous helium was introduced from the fuel gas supply path 44a side, and the pressure of 50kPa(s) was applied to said fuel gas supply path 44a. Subsequently, fuel gas supply path 44a was blockaded, and the pressure in the phosphoric acid fuel cell 12 of 120 seconds after was measured.

[0052] On the other hand, when measuring the amount of out leaks from the cathode lateral electrode 18, where oxidizer gas discharge path 46b, fuel gas supply path 44a, and fuel gas discharge path 44b are blockaded, gaseous helium was introduced from the entrance side of oxidizer gas supply path 46a, and the pressure of 50kPa(s) was applied to said oxidizer gas supply path 46a. Subsequently, oxidizer gas supply path 46a was blockaded, and the pressure in the phosphoric acid fuel cell 12 of 120 seconds after was measured.

[0053] The result is shown in drawing 7 . Thereby, the increment in the amount of out leaks in the anode lateral electrode 16 and the cathode lateral electrode 18 was not accepted after operation of 300 hours.

[0054] some phosphoric acid fuel cells 102 with which the electrolyte and the electrode zygote 100 which drawing 8 requires for the 2nd operation gestalt of this invention are incorporated -- it is a cross-section explanatory view. In addition, the same reference mark is given to the same component as the electrolyte, the electrode zygote 10, and phosphoric acid fuel cell 12 concerning the 1st operation gestalt, and the detailed explanation is omitted.

[0055] While the frame-like seal member 20 is joined between an electrolyte membrane 14 and the cathode lateral electrode 18, as for this electrolyte and electrode zygote 100, frame-like seal member 20a is joined between said electrolyte membranes 14 and anode lateral electrodes 16. The frame-like seal members 20 and 20a are equipped with the inner circumference side edge sections 22 and 22a which crook thru/or curve in the direction estranged from an electrolyte membrane 14, and each other are set as the object configuration.

[0056] Thus, it is crooking thru/or curving in the direction which the inner circumference side edge sections 22 and 22a of the frame-like seal members 20 and 20a joined to the double-sided edge section of an electrolyte membrane 14 estrange from both sides of said electrolyte membrane 14 in the electrolyte and the electrode zygote 100 constituted, and said inner circumference side edge sections 22 and 22a do not have said thing [that it is hard electrolyte membrane 14, or the acute-angle section contacts this electrolyte membrane 14].

[0057] Thereby, with the 2nd operation gestalt, while an electrolyte membrane 14 can be certainly protected from damage and the endurance of said electrolyte membrane 14 improves, the gas-seal nature of the phosphoric acid fuel cell 102 whole can be raised effectively, and the same effectiveness as the 1st operation gestalt is acquired, such as becoming possible to secure the desired generation-of-electrical-energy engine performance.

[0058] In addition, although the electrolyte membrane 14 which constitutes an electrolyte and the electrode zygote 10,100 infiltrates liquid electrolytes, such as a phosphoric acid, into poly membranes, such as polybenzimidazole, and consists of the 1st of this invention, and the 2nd operation gestalt, this can be substituted and the ion exchange membrane which infiltrated water into the poly fluoro ethylene sulfonic acid etc. can constitute. In that case, a phosphoric acid fuel cell 12,102 will be substituted and a polymer electrolyte fuel cell will be used.

[0059]
[Effect of the Invention] In the electrolyte and electrode zygote concerning this invention, the inner circumference side edge section of a frame-like seal member is set as the configuration which crooks thru/or curves in the direction estranged from an electrolyte membrane, and said inner circumference side edge section does not have said thing [it being hard an electrolyte membrane or contacting], and can prevent damage on this electrolyte membrane as much as possible. By this, the endurance of an electrolyte membrane will improve effectively.
[0060] Moreover, in the fuel cell concerning this invention, while preventing that an electrolyte membrane is damaged through a frame-like seal member as much as possible and raising gas-seal nature effectively, the desired generation-of-electrical-energy engine performance is maintained, and an efficient generation of electrical energy becomes executable.

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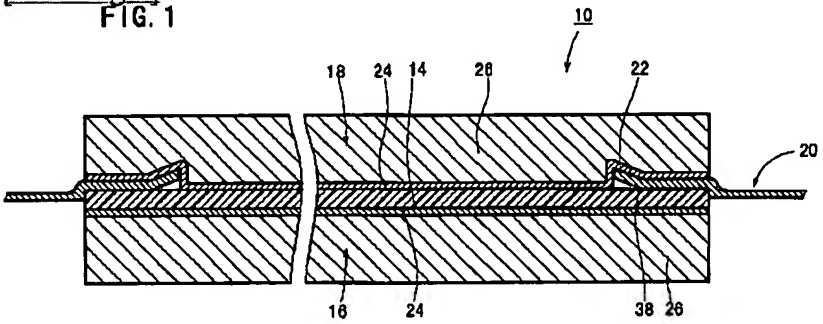
DRAWINGS

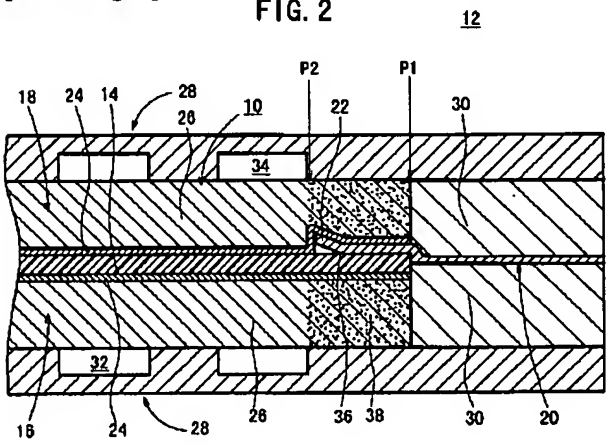
[Drawing 1]

FIG. 1



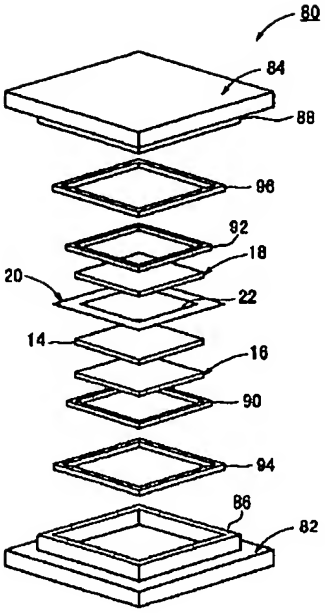
[Drawing 2]

FIG. 2



[Drawing 4]

FIG. 4



[Drawing 6]

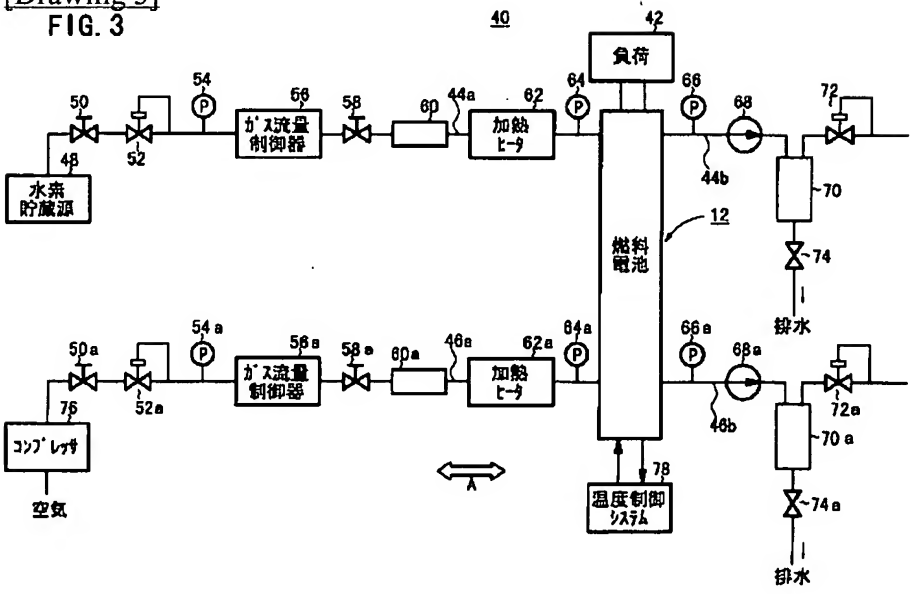
FIG. 6

クロスリーク量

	アノード側電極16からカソード側電極18へ	カソード側電極18からアノード側電極16へ
運転前	0.05cc/min	0.05cc/min
300時間運転後	0.03cc/min	0.02cc/min

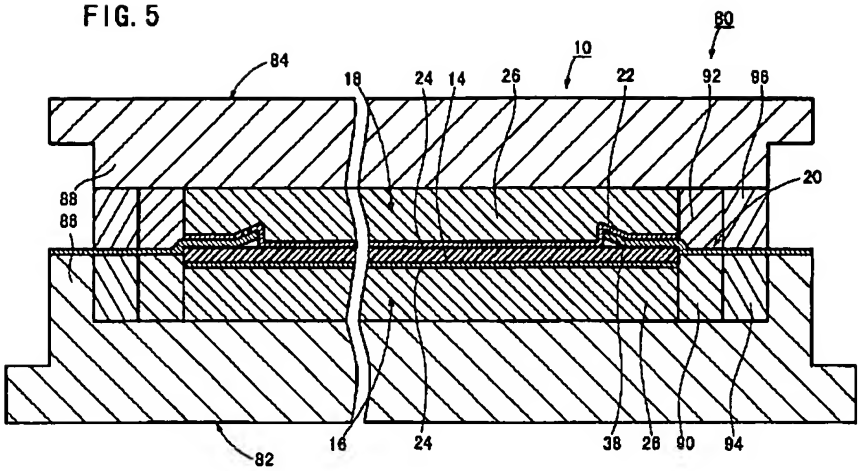
[Drawing 3]

FIG. 3



[Drawing 5]

FIG. 5



[Drawing 7]

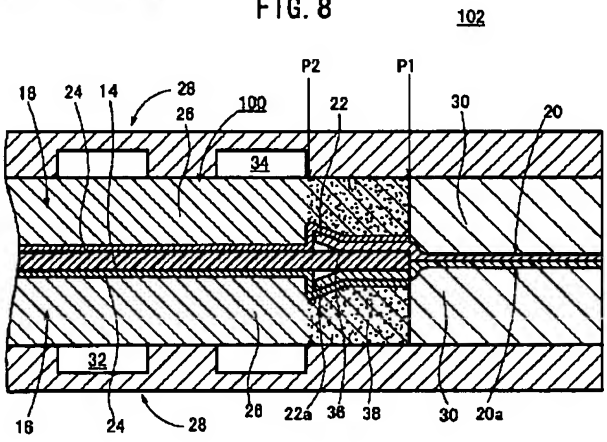
FIG. 7

アウトリーク量

	アノード側電極16側 (120秒後の圧力)	カソード側電極18側 (120秒後の圧力)
運転前	50kPa	50kPa
300時間運転後	50kPa	50kPa

[Drawing 8]

FIG. 8



[Translation done.]